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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/025,085	12/19/2001	Cher Huan Tan	2085-00600 (IME-P002US)	4906

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EXAMINER

PHAM, THANHHA S

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 11/05/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/025,085

Applicant(s)

TAN ET AL.

Examiner

Thanhha Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 8/12/02 and interview dated 10/29/02.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 6-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

This Office Action responds to Applicant's election dated 8/12/02 on Paper No. 5 and a phone interview dated 10/29/02 with Jonathan Harris.

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-10, drawn to a method for photolithographic patterning in a via-first dual damascene process, classified in class 438, subclass 637+.
 - II. Claims 11-20, drawn to a photolithographic pattern in an integrated circuit manufactured using a via-first dual damascene process, classified in class 257, subclass 1+.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product invention II can be made by another and material different process. For example, the structure of product invention II with photoresist isolated from an insulation layer can be formed by: providing the insulation layer on a wafer substrate; depositing an fill-in material on the insulation layer for isolating the insulation layer from photoresist deposited thereafter; depositing a

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photoresist layer fill-in material and the insulation layer in which the photoresist layer is exposed and developed for providing a photoresist mask pattern for subsequent etching of the insulation layer; etching the fill-in material and the insulation layer to define an aperture in the insulation layer; further opening the photoresist mask pattern to define a trench photoresist mask pattern on the fill-in material and the insulation layer for subsequent etching of the insulation layer (Notice: in claim 11 of the invention production II, there is no the fill-in material in the aperture in the final structure of claim 11). The structure of product invention II can also be formed by another different process by: forming a fill-in material pattern on a wafer substrate; selectively depositing a insulation layer on sides of said fill-in material pattern to alleviate the step of forming the aperture etched in the insulation layer; further depositing the fill-in material on the top of the insulation layer and said fill-in material pattern wherein the fill-in material on the top of the insulation layer and said fill-in material pattern the insulation layer from photoresist deposited thereafter; depositing a photoresist layer on the fill-in material, said fill-in material pattern, and the insulation layer in which the photoresist is exposed and developed for providing a photoresist mask pattern for subsequent etching of the insulation layer; and removing the fill-in material pattern.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

2. The method invention I in this application contains claims directed to the following patentably distinct species of the claimed invention:

1a. Species 1a, claims 1-5, drawn to the photolithographic method of the 1st embodiment wherein the step of filling the aperture comprises the step of full-fill the aperture.

1b. Species 1b, claims 1, 6-10, drawn to the photolithographic method of the 2nd embodiment wherein the step of filling the aperture comprises the step of partially filling the aperture.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claim 1 is generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

3. Per election on paper no. 5 dated 8/12/02, Applicant elects the method invention I with traverse. During a telephone conversation with Jonathan Harris on 10/29/02, a provisional election was made with traverse to prosecute the species Ia of the method invention I of claims 1-5. Affirmation of this election must be made by applicant in replying to this Office action. Claims 6-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to non-elected inventions.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, lines 4-7, it is not clear how a photoresist layer can be isolated from the insulation layer when only the aperture is filled with a fill-in material (top surface of the insulation layer is not covered by the fill-in material) then the photoresist layer is deposited on the insulation layer.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

- (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
- (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

6. Claims 1-4, as being best understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Wang et al [US 6,057,239].

Wang et al, figs 3's and related text col 1-4, discloses the claimed photolithographic patterning method in a via-first dual damascene process involving the use of a low-k dielectric layer material as an insulation layer on a wafer substrate during fabrication of an integrated circuit comprising steps of:

filling an aperture (32, figs 3B-C) etched into an insulation layer (12/13/20) on a wafer substrate (10) with a fill-in material (40), the fill-in material filling the aperture and covering top surface of the insulation layer for isolating the insulation layer from photoresist layer deposited thereafter;

depositing a photoresist layer (50, fig 3D) on the fill-in material and over the insulation layer;

exposing and developing the photoresist layer for providing a photoresist mask pattern (50) for subsequent etching the insulation layer;

[see col 3 lines 61-65 for details]

removing the fill-in material from the aperture (fig 3G).

With respect to claim 2, Wang et al teaches filling the aperture comprises full filling the aperture (fill-in material 40, fig 3C).

With respect to claims 3-4, Wang et al teaches full filling the aperture with a solvent based fill-in material of antireflective coating (spin-on antireflective material 40, see col 3 lines 54-61).

7. Claims 1-4, as being best understood, are rejected under 35 U.S.C. 102(e) as being anticipated by Hussein et al [US 6,329,118].

Hussein et al, figs 1's and related text col 1-10, discloses the claimed photolithographic patterning method in a via-first dual damascene process involving the use of a low-k dielectric layer material as an insulation layer on a wafer substrate during fabrication of an integrated circuit comprising steps of:

filling an aperture (107, fig 1c-d) etched into an insulation layer (103) on a wafer substrate (100) with a fill-in material (104), the fill-in material filling the aperture and covering top surface of the insulation layer for isolating the insulation layer from photoresist layer deposited thereafter;

depositing a photoresist layer (136, fig 1e) on the fill-in material and over the insulation layer;

exposing and developing the photoresist layer for providing a photoresist mask pattern (136, col 6 lines 53-60 and col 4 lines 58-62) for subsequent etching the insulation layer;

removing the fill-in material from the aperture (fig 1f).

With respect to claim 2, Hussein et al teaches filling the aperture comprises full filling the aperture (fill-in material 104, fig 1e).

With respect to claims 3-4, Wang et al teaches full filling the aperture with a solvent based fill-in material of antireflective coating (dyed spin-on-polymer or dyed spin-on glass 104, col 5 lines 31-45 and col 6 lines 12-19).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 5, as being best understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al [US 6,057,239] or Hussein et al [US 6,329,118], as applied to claim 4 above, in further view of Ding et al [US 5,981,145].

Wang et al and Hussein et al substantially disclose the claimed method including full filling the aperture with a solvent based fill-in material having characteristics of antireflective coating. Wang et al and Hussein et al are silent about full filling the aperture with a water soluble fill-in material as top antireflective coating.

However, Ding et al, the whole document with particularly col 2 lines 32-65 and col 7 lines 11-24, suggests using the antireflective coating with water-soluble fill-in material (strongly absorbing polymer that is soluble in water or water miscible organic solvent) would provide a better image transfer, (thinner coatings beneath the photoresist), a low toxicity hazard and easy handling or transportation in photolithographic patterning method.

Therefore, it would have been obvious for those skilled in the art to combine the teaching of Ding et al to the process of Wang et al or Hussein et al to use the water soluble fill-in material to full fill the aperture for improving photolithographic pattern method with reasons given above.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (703) 308-6172. The examiner can normally be reached on Monday-Thursday 8:00 AM - 7:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-3432 for regular communications and (703) 308-7725 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Thanhha Pham
October 31, 2002


CARL WHITEHEAD, JR.
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